# Manufacturing Strategy Configurations, Contingencies and Performance

Dukovska-Popovska, Iskra; Boer, Harry

*Publication date:*
2008

*Document Version*
Publisher's PDF, also known as Version of record

# MANUFACTURING STRATEGY CONFIGURATIONS, CONTINGENCIES AND PERFORMANCE

*Iskra Dukovska-Popovska[1], Harry Boer[2]*

*[1]Assistant Professor, Ph.D., Department of Production, Aalborg University*
*Fibigerstræde 16, 9220 Aalborg Øst, DK*
*E-mail: iskra@production.aau.dk*
*[2]Professor, Ph.D., Center for Industrial Production, Aalborg University*
*Fibigerstræde 16, 9220 Aalborg Øst, DK*

## ABSTRACT

The main reasoning in the contingency perspective on manufacturing strategy theory is that context influences manufacturing strategy which in turn influences business performance. The study presented in this paper broadens this perspective by exploring if the business and operational performances are influenced only by manufacturing strategy, if the manufacturing strategy-performance relationship is moderated by the external contingencies, or even if external contingencies influence the performance directly. We use data from the fourth round of the International Manufacturing Strategy Survey (IMSS) to study this question. The results show that performance is not exclusively a result of manufacturing strategy choices. Some performance variables result solely from contextual influences, others are the result of manufacturing strategy configuration only, while in several cases the interaction between context and strategic configuration interaction determines performance. An interesting dividend from this research is performance indicators for different strategies.

**Keywords:** manufacturing strategy, contingencies, business and operational performance, survey

## INTRODUCTION AND RESEARCH PROBLEM

The context-strategy-performance relationship has been a popular research topic in the area of *business* strategy in the last two decades (e.g. Hill 1988, Lawless and Finch 1989). The main logic in most of the research in the area is that environmental change requires strategic response, and that performance is an effect of strategy choice. Other research (Parnell 1998) has explored the influence of performance on strategic change.

However, there are relatively few studies (Swamidass and Newell 1987, Ward et al. 1995) that investigate the relationships between *manufacturing* strategy, context and performance. In their model, Swamidass and Newell (1987) consider only environmental uncertainty (as a contextual variable), manufacturing flexibility and the role of manufacturing managers in strategic decision making (as manufacturing strategy variables). They confirm their hypothesis that manufacturing strategy is a major determinant of business performance and that context is a determinant of manufacturing strategy. However, the authors note that they do not consider the effects of other contingencies such as competitive context, organizational context, processes, size, technology, and structure. Ward et al. (1995) explore the influence a wider range of environmental factors has on the choice of competitive priorities and the performance of companies. Lately, research in the manufacturing strategy area has dealt with, amongst others, exploring the extent to which changes

in manufacturing strategy configurations are reflected in changes in performance (Acur et al. 2006). Related research has focused on the drivers of change in manufacturing strategy configurations (Acur et al. 2004). However, all these authors make the basic assumption that context affects strategy and that strategy affects performance.

In this paper, we try to go beyond this assumption and address the following question:

*Where and how does context affect the manufacturing strategy-performance relationship?*

We assume that there may be contingencies that affect performance directly, while other contingencies may have a moderating effect on the strategy-performance relationship. For example, if a company changes from a price-based strategy to a product-based strategy, the price-oriented customers may leave in favor of another low cost leader. At the same time, those willing to pay for differentiated products may not recognize the new strategy and will likely recall remnants of the previous strategy (Parnell 1998).

Therefore, the present research is aiming to explore if the business and operational performances are influenced only by manufacturing strategy, or the manufacturing strategy-performance relationship is moderated by the external contingencies. We do not even exclude to find direct influence of external contingencies on performance.

## METHODOLOGY

### *Data source*

To tackle the research question, we use data from the fourth round of the International Manufacturing Strategy Survey (IMSS IV). IMSS is a co-operative research network of business schools, providing a common database for the study of manufacturing strategies, practices and performances on both global and national scale. IMSS IV data have been collected for manufacturing companies (ISIC 28-35) from a range of countries worldwide during 2005. The survey is purposefully biased towards best practice companies. In total 711 companies from 23 countries are included in the IMSS IV database.

### *Operationalization of variables*

For the aims of this paper, only some of the questions and categories of data from the IMSS IV survey were of relevance. Data about companies' current competitive priorities (11 competitive priorities) has been used to identify strategic configurations. The performance of the companies has been identified through four business and 24 operational performance indicators. Furthermore, the influence of seven external contingencies has been studied. The respondents evaluated all those variables using five-point Likert scales.

### *Data analysis*

1. *Identification of manufacturing strategy configurations*. At the beginning, we conducted two-step clustering from which we obtained four clusters of companies. Furthermore, we performed factor analysis on 11 competitive priorities. As a result we obtained five factors: price, quality, product variety, service, and flexibility, through which we could describe four clusters (strategy configurations). The factors extracted as well as the strategy configurations (clusters) coincide with the results from a previous analysis reported by Cagliano et al. (2005). The configurations identified are:
    a. *Market-based companies* focusing on high product quality, high flexibility, superior customer service and product variety, but not focusing on affordable prices.
    b. *Product-based companies* putting effort into frequent product innovation and variety,

superior design and quality and superior customer service.

c. *Price-based companies* operate on the basis of affordable prices, high quality, and flexibility.
d. *Capability-based* companies seek to compete through high product quality, good service, flexibility and affordable sales prices.

The cluster analysis excluded 63 out of 711 companies. Product-based companies represent 29.6%, capability-based – 25.3%, market-based – 22.2% and price-based – 22.8% of the total number of companies studied.

2. *Investigation of the strategy-performance link*. In order to compare how companies with different strategic configurations perform we conducted a one-way ANOVA. First we considered four business performance indicators as dependent variables (sales, market share, return on sales (ROS), and return on investment (ROI)). Next, we took into consideration 24 operational performance indicators as dependent variable.
3. *Investigation of the influence of contingencies with the strategy-performance link*. Finally, we investigated how contingencies impact the strategy-performance relationship. For this purpose, we conducted a two-way ANOVA. We used two independent variables (strategy configuration and contingency) and one dependent variable (performance). Hence, we could identify if the effect of strategy on performance depends on context or not. For these analyses, we considered market dynamics, market span, product focus, geographical focus, competition intensity, market concentration, and market entry. If we did not identify a configuration-contingency interactive effect, but rather a pure contingency effect, we conducted a one-way ANOVA between contingency and performance to see how performance is affected by the specific contingency.

## RESULTS AND DISCUSSION

### *Strategy configuration-business performance link*

The analysis of the manufacturing strategy configuration link with performances allowed us to find out if there is a difference in business performance between each of the configurations.

The analysis of the mean scores of business performance pointed out that there is a significant difference between different configurations in only one business performance dimension, namely current ROS. Product-based companies show a significant difference in current ROS compared to capability-based companies. Product-based companies record the highest ROS, while capability-based companies record the lowest.

### *Strategy configuration-operational performance link*

The one-way ANOVA analysis pointed out that strategy affects various different operational performance indicators.

Regarding *manufacturing conformance* relative to main competitors, market-based companies are statistically significantly different from capability-based companies. Market-based companies record the highest, while capability-based the lowest manufacturing conformance.

*Product customization* ability is significantly different in market-based vs. capability-based companies, and product-based vs. capability-based companies. Market-based companies record the highest, while capability-based have the lowest product customization ability.

Regarding *time-to-market* performance, market-based companies differ significantly from price-

based and capability-based companies, and product-based companies are significantly different from capability-based companies. Again, market-based show the highest and capability-based companies the lowest performance.

Moving to *product innovativeness* performance, market-based and product-based companies perform best; the performance of price-based and capability-based companies is significantly lower.

*Customer service and support* performance is significantly different between market-based and capability-based companies, with the first configuration showing the highest performance.

Market-based and price-based companies show the highest, while product-based and capability-based companies have the lowest delivery speed performance. These differences are not statistically significant, though.

Regarding *manufacturing lead time,* market-based companies recorded the highest performance, while capability-based the lowest performance.

Market-based companies show the highest, while price-based and capability-based companies score the lowest *labor productivity* performance. However, these differences are not significant.

Regarding *throughput time efficiency*, price-based companies record the highest performance, while product-based and capability-based companies have the lowest performance. Again, however, the differences are not significant

So, except for throughput time efficiency, market-based companies show the highest operational performance in terms of the indicators extracted above. Product-based companies perform best on product innovativeness together with market-based companies, while price-based companies perform best on throughput time efficiency. Capability-based companies perform poorest on all performance dimensions, in some cases together with other configurations: with price-based companies on time-to-market, product innovativeness and labor productivity, and with product-based companies on delivery speed, manufacturing lead time, and throughput time efficiency.

It should be noted that the mean values for each performance dimension for each configuration lies between 3 and 3.7. This means that on average all configurations perform rather well and that the differences between "highest" and "lowest" are relatively small. It is also important to note that the above findings are preliminary and, as yet, inconclusive. We will scrutinize them further by carrying out an additional two-way ANOVA analysis, in which the influence of external contingencies is considered.

### *The impact of contingencies on the strategy-performance relationship*

In this sub-section, we take the investigation one step further and consider the impact of external contingencies on the strategy configuration-performance relationship. By using a two-way ANOVA we could test the "main effect" for each independent variable and explore the possibilities of "interaction" effects as well.

***ROS.*** Return on sales depends partly on the strategy configuration, partly on two contingencies: geographical focus and competition intensity. Additional one-way ANOVA shows that when the focus is on the national market, ROS is highest; when the company focuses on international markets, ROS has the lowest value. Furthermore, if competition is intensive, ROS is low; in less intensive environments, ROS is high.

*Discussion*: The findings regarding geographical focus are expected: the costs of coordination and logistics in a national (local) market are significantly lower than in international (global) markets, thus resulting in a higher ROS. With respect to competition intensity the findings could be expected, too: if rivalry is low, companies can increase product prices, and thus achieve a higher

ROS. To a certain degree, ROS is affected by the strategy configuration. Capability-based companies record the lowest ROS, while product-based companies obtain the highest ROS. One explanation for this can be found in the characteristic of capability-based companies: they mainly produce low-value added components, while product-based companies focus on differentiation and unique products. Although it is a more risky strategy, the second option supports gaining a higher ROS than the first strategy.

***Manufacturing conformance***. This performance depends solely on configuration and not on any contingency. Therefore the findings from the one-way ANOVA are valid.

*Discussion*: Capability-based companies have the lowest, while market-based firms report the highest conformance. Capability-based companies have the technological capacity to produce different types of ordered products/components, and usually work with general-purpose machines. Thus, it can be expected that manufacturing conformance is lower compared to other types of companies. Market-based companies record the highest manufacturing conformance, which is likely due to the fact that they focus on quality rather than on obtaining affordable prices.

***Product customization***. The two-way ANOVA did not reveal that product customization is an effect of configuration, contrary to the one-way ANOVA. Product customization depends solely on market dynamics. Companies whose market is growing report higher performance than companies whose market is declining.

*Discussion*: Usually, a market declines at the end of the product life cycle, and in that phase customers do not ask for product customization.

***Time to market***. There are strong indications that time to market is affected by strategy rather than context. However, this is not absolutely conclusive for all the contingencies, since there are two contingencies for which the two-way ANOVA test does not extract the configuration as an important factor. Market entry interacts with strategy, with a significant difference between market-based vs. price-based and capability-based companies. If the market is closed to new players, time to market is shortest for companies with a market-based strategy, and longest for companies with a product-based strategy. Market-based companies record the best performance on time to market in all levels of market entry, except when the market is completely open to new entrants. On the other hand, price-based and capability-based companies have the lowest performance on time to market. When the market is open, product-based companies score best on time to market. The last result is not statistically significant.

*Discussion:* Market-based companies report the best time to market performance, which is most likely due to these companies having to continuously screen, and react adequately to, the requirements of the market place. Product-based companies perform high on this parameter, too. Time-to-market is very important for this type of companies. They put significant effort into finding the right time for launching their products into the market place. For capability-based companies, time to market is not an important characteristic, which is reflected in lower values of this performance aspect.
Time to market is affected by the interaction between market entry and strategy. In closed markets, market-oriented companies perform best on time to market; product-based companies perform poorest. We do not have any good explanation for that.

***Product innovativeness***. The two-way ANOVA validates the finding from the one-way analysis, namely that product innovativeness is an effect of strategy only.

*Discussion*: Market- and product-based companies record the highest performance. This is evident from the basic nature of the companies in the sense that the main focus of these companies is product innovativeness and variety. Price-based companies focus on standard products. Capability-based firms produce to customer specifications but do not develop new products themselves.

***Customer service and support***. The two-way ANOVA indicates that customer service is affected by two contingencies: market dynamics and product focus. When the market declines rapidly, customer service is lowest; when the market grows rapidly, customer service is highest. The two-way ANOVA extracts strategy as important, but does not show interaction effects with market dynamics. If the product focus moves to service attributes, customer service, not surprisingly, increases. Finally, when testing the effect of geographical focus, only strategy emerges as an important factor.

*Discussion*: Market-based companies have the highest performance for customer service. This is a result of customer intimacy, a crucial factor for these companies. Capability-based companies perform poorest on customer service. Since these companies exist from providing services to their customer, this is a rather unexpected finding, which could, however, be due to these companies not perceiving their manufacturing process as a service activity. Regarding the influence of market dynamics, the following can be inferred: if the market declines, the product is at the end of the life cycle, so customer service is lowest. If, however, the market grows rapidly, customer service is the highest. A possible explanation could be that customer service becomes an important order winner in rapidly growing markets.

***Delivery speed***. This performance depends on the interaction between competition intensity and strategy. If competition intensity is low, market-based and product-based companies perform poorest on delivery speed, and price-based companies have the best delivery speed. If competition intensity is high, price-based and market-based companies perform better on delivery speed than companies pursuing one of the other strategies.
Furthermore, delivery speed depends on market dynamics and market concentration. If the market is stable, delivery speed is higher than if the market is declining *or* growing rapidly. If there are few competitors, companies perform better on delivery speed than when there is a medium or high number of competitors.

*Discussion*: If competition intensity is low, the market-based and product-based companies have the lowest performance on delivery speed, while the price-based companies score highest. Price-based companies produce and stock standard products and therefore their delivery time is the shortest. Market-based companies develop to order, and therefore their delivery speed is the lowest. Why product-based companies score low is not clear. Furthermore, if competition intensity is high, the price-based and market-based companies perform better than the other configurations. It is quite intriguing how the market-based companies achieve this. However, if these companies assemble standard components to order (such as for example Dell Computers), this finding is quite realistic. Further research is needed to check this explanation
If the market is growing rapidly, delivery speed is the lowest. This makes logical sense, since the companies need time to respond to the growing market. However, it is not very clear why delivery speed is also low when the market is declining rapidly. One possible explanation may be that the companies want to adjust (by moving the order decoupling point upstream) to the rapidly declining and, thus, uncertain market, which consequently decreases their delivery speed.
Regarding market concentration, if there are few competitors in the market, delivery speed is highest. If the number of competitors is increases, delivery speed gets lower. We do not have an adequate explanation for this finding.

***Manufacturing lead time***. The two-way ANOVA showed that manufacturing lead time is a result of the interaction between geographical focus and strategy. The effects are significantly different for market-based and capability-based companies, respectively.

*Discussion*: If the focus is on purely national or purely international markets, there are no significant lead time differences between the different configurations, although it can be noticed that capability-based companies have the lowest performance. This is probably a result of these

companies' functional layout. If the geographical focus is on a national or slightly international level, the market-based companies record the lowest performance on lead time, while capability-based companies score highest. This finding is probably due to the width of the product portfolio of these two types, combined with the layout choices made to support their production processes. However, the situation turns around when the company focuses on international markets, and slightly on national markets. Then, market-based companies perform best, and capability-based poorest. One explanation is that market-based companies have adjusted their production to the different requirements of international markets by for example introducing standard components and modularity, as well as a line layout, to decrease the lead time of their production processes. On the other hand, capability-based companies are more inert in their response to the different requirements of the international markets, especially if they maintain their functional layout.

***Labor productivity***. This performance dimension depends solely on competition intensity. An additional one-way ANOVA shows that if competition intensity moves from low to middle, labor productivity increases rapidly. If the intensity increases even further, from middle to high – labor productivity stagnates.

*Discussion*: This finding suggests that at some point productivity reaches its limit.

***Throughput time efficiency***. This performance is an effect of the interaction between competition intensity and strategic configuration. The significant differences appear between price-based and product-based, and price-based and capability-based companies, with price-based companies recording the highest throughput time efficiency.
Besides this, throughput time efficiency is also an effect of product focus, geographical focus and market entry. If product focus is on service attributes, throughput time is higher than if the focus is on product attributes. If the company focuses on the national market, throughput time efficiency is highest. As the focus is moving to the international level, this performance declines rapidly. If the market is open to new players, throughput time efficiency is highest.
Finally, there are some indications that throughput time efficiency is affected by strategy (in three out of seven two-way ANOVA tests).

*Discussion*: The findings regarding throughput time efficiency point out that this performance is influenced by the interaction between competition intensity and strategy configuration. If competition intensity is low, price-based and capability-based companies have the highest performance, while the product-based and market-based perform worst. This is understandable for the price-based companies since they focus on decreasing costs, and a large part of this is achieved by eliminating non-value added activities. However, capability-based companies tend to have a job shop layout and, consequently, a low throughput time efficiency. Thus, our finding is hardly explainable. Moreover, it is not clear why product-based companies record one of the lowest performances, when it is supposed that they have line layout and should thus be able to achieve high throughput time efficiency. If competition intensity is high, throughput time efficiency is almost the same for the four strategy configurations.
Companies focusing on service attributes have a shorter throughput time than those focusing on product attributes. There are always much less waiting times and non-value adding activities in services (especially when the service has been scheduled for the individual customer), than in offering product attributes. The service is delivered in direct interaction with the customer, thus the waiting times are incomparable with the waiting times in production. A focus on the national market leads to a relatively higher throughput time efficiency, probably because of lower, non-value adding, logistical and coordination activities. Finally, if the market is open to new players, throughput time efficiency is highest. The only explanation we can find is that companies try to improve their throughput time efficiency to increase the price barriers for potential entrants.

## CONCLUSION

The purpose of this paper was to challenge the long-time established assumption that contingencies affect strategy and, through that, performance, but do not affect performance directly. In order to answer the research question, we first summarize the findings in the Table-1, which presents the factors are affecting each of the observed performance dimensions.

**Table-1. Contingency and strategy configuration factors affecting business and operational performance**

| | Contingency | Configuration | Interaction |
|---|---|---|---|
| ROS | Geographical focus<br>Competition intensity | + | |
| Manufacturing conformance | | + | |
| Product customization | Market dynamics | | |
| Time to market | | + | Market entry & configuration |
| Product innovativeness | | + | |
| Customer service | Market dynamics<br>Product focus | + | |
| Delivery speed | Market dynamics<br>Market concentration | | Competition intensity & configuration |
| Manufacturing lead time | | | Geographical focus & configuration |
| Labor productivity | Competition intensity | | |
| Throughput time efficiency | Product focus<br>Geographical focus<br>Market entry | + | Competition intensity & configuration |

The research question was:

*Where and how does context affect the manufacturing strategy-performance relationship?*

The analysis in this paper extracted four performance indicators that are affected by an interaction between contingencies and strategy: time to market, delivery speed, manufacturing lead time and throughput time efficiency. Two performance indicators, product customization and labor productivity, are directly affected by contextual aspects, but not by the strategy. Both strategy and context affect ROS and customer service, but independently of each other. Manufacturing conformance and product innovativeness depend solely on strategy.

An interesting dividend from this research is the findings regarding the performance of different strategy configurations (Table-2a&b).

**Table-2a. Performance effects of different strategy configurations**

| | *ROS* | *Manufacturing conformance* | *Time to market* | *Product innovativeness* | *Customer service* |
|---|---|---|---|---|---|
| *Market* | | Highest | Highest | Highest | Highest |
| *Product* | Highest | | High | Highest | |
| *Price* | | | | Lowest | |
| *Capability* | Lowest | Lowest | Low | Lowest | Lowest |

**Table-2b. Performance effects of different strategy configurations in relation to contingencies**

| | *Market entry* | *Time to market* | *Competition Intensity* | *Delivery speed* |
|---|---|---|---|---|
| *Market* | Closed | Highest | Low<br>High | Lowest<br>Highest |
| *Product* | Closed<br>Open | Lowest<br>Highest | Low | Lowest |
| *Price* | | | Low<br>High | Highest<br>Highest |
| *Capability* | | | | |
| | Geographical focus | Manufacturing lead time | Competition Intensity | Throughput time efficiency |
| *Market* | National + international<br>International + national | Lowest<br>Highest | Low<br>High | Lowest<br>Average |
| *Product* | | | Low<br>High | Low<br>Average |
| *Price* | | | Low<br>High | Highest<br>Average |
| *Capability* | National + international<br>International + national | Highest<br>Lowest | Low<br>High | High<br>Average |

These tables show:

- Market-based companies record the highest performance on most of the operational performance parameters. They have to pay more attention to delivery speed and throughput time efficiency, when the intensity of competition is low. Their performance is also lowest on manufacturing lead time if they focus on national rather than international markets.
- Product-based companies have the highest return on sales (ROS). They also score highest on several operational performance parameters. Like market-based companies, they, too, have to pay more attention to delivery speed and throughput time efficiency when the competition intensity is low.
- Price-based companies have an average performance on most of the parameters, except delivery speed and throughput time efficiency, on which they perform well.
- Capability-based companies have the lowest performance on many of the performance parameters, except throughput time efficiency when the competition is low, and manufacturing lead time performance when the focus is more on national than on international markets.
- Market-based and product-based companies do not put effort on time efficiency if they are dealing with national markets only.

Table-1 and Table-2a&b show that competition intensity is the most frequent contingency influencing the performances; market concentration is the least influential contingency.

This research shows that strategy is not the sole driver of the success (or lack thereof) of companies – external contingencies play a role too. Managers have to be aware of the effects these contingencies have on their company's performance, either directly or through moderating the strategy-performance relationship. Thus, this research makes a step further towards bringing closer the external environment to the manufacturing strategy.

Finally, in our discussion of the various findings, we made some assumptions about the types of the companies representing each of the strategy configurations. We need to conduct additional analyses in order to check our assumptions and find out how the following contingencies (and possibly others as well) affect performance:

- Type of industry/product
- Customer order decoupling point, layout
- Technology
- Company size (e.g. are price-based and product-based companies larger than capability-based and market-based companies and, if so, what effect does that have?).

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